

P a t e n t C l a i m s

1. Method for producing a grating image (16, 19), which at least has one grating field (6, 61, 62, 63, 64, 65, 66), comprising the following steps:
  - defining a contour line (9) of the grating field (6, 61, 62, 63, 64, 65, 66),
  - filling the contour line (9) with the grating pattern (10), the grating pattern (10) within the contour line (9) being described by grating coordinates,
  - supplying the grating coordinates to a writing apparatus and
  - producing the grating pattern (10) in a substrate with the writing apparatus and with the help of the grating coordinates.
2. Method according to claim 1, **characterized in that** the grating pattern (10) is formed by grating lines (13) which are disposed side by side.
3. Method according to claim 2, **characterized in that** as grating coordinates are selected the intersection points, the grating lines (13) have with the contour line (9), as well as, optionally, grating points of the grating field (6, 61, 62, 63, 64, 65, 66) lying within the contour line.
4. Method according to one of the claims 1 to 3, **characterized in that** with the help of a data processing system the contour line of the grating field (6, 61, 62, 63, 64, 65, 66) is created and filled with the grating pattern (10).
5. Method according to at least one of the claims 1 to 4, **characterized in that** the grating lines are straight or curved.
6. Method according to at least one of the claims 1 to 5, **characterized in that** the grating coordinates of the grating lines (13) are sequentially sorted according to their spatial disposition.
7. Method according to claim 6, **characterized in that** the coordinates of a starting point (14) of a grating line (13) are sorted side by side with the respective coordinates of a starting point (14) of a neighboring grating line

- (13) and the coordinates of an end point (15) of a grating line (13) side by side with the respective coordinates of an end point (15) of a further neighboring grating line (13).
8. Method according to claim 7, **characterized in that** the starting points and end points of grating lines (13) located side by side are connected to form a meandering processing path (17).
  9. Method according to one of the claims 1 to 8, **characterized in that** the writing apparatus with the help of radiation causes a change of state in a radiation-sensitive material.
  10. Method according to claim 9, **characterized in that** the writing apparatus is guided over the radiation-sensitive material according to the grating coordinates.
  11. Method according to claim 9 or 10, **characterized in that** as a radiation-sensitive material a photoresist layer applied onto a substrate plate is used.
  12. Method according to one of the claims 1 to 11, **characterized in that** as a writing apparatus an electron beam is used.
  13. Method according to one of the claims 9 to 12, **characterized in that** after the caused change of state a metallization layer is applied onto the radiation-sensitive material and that therefrom a metallic molding is galvanically produced.
  14. Method according to claim 13, **characterized in that** the molding is used as an embossing die for embossing a grating image into a substrate.
  15. Grating image, which has at least one image field separately perceptible with the naked eye, in which a grating pattern consisting of not interrupted grating lines is disposed, which is produced by means of a lithography instrument.

16. Grating image according to claim 15, **characterized in that** as a lithography instrument focussed light radiation or a focussed particle beam, in particular an electron beam, is used.
17. Grating image according to claim 15 or 16, **characterized in that** the grating image has several image fields.
18. Grating image according to at least one of the claims 15 to 17, **characterized in that** the grating image has further image parts, which are manufactured with the help of a different technique.
19. Grating image, according to at least one of claims 15 to 18, **characterized in that** the grating pattern consists of grating lines, which form a diffraction grating.
20. Grating image according to at least one of the claims 15 to 19, **characterized in that** the grating lines (13) are connected to at least one meandering grating line by reversing sections (23) disposed at their ends (14, 15).
21. Grating image according to at least one of the claims 15 to 20, **characterized in that** the reversing distances (23) are rounded.
22. Security element with a grating image according to at least one of the claims 15 to 21.
23. Security element according to claim 22, **characterized in that** the security element is a security thread, a label or a transfer element.
24. Security paper with a grating image according to at least one of the claims 15 to 21.
25. Security paper with a security element according to claim 22 or 23.
26. Security document with a grating image according to at least one of the claims 15 to 21.
27. Security document with a security element according to claim 22 or 23.

28. Security document with a security paper according to claim 24 or 25.
29. Transfer material, in particular hot stamping foil with a grating image according to claims 15 to 21.
30. Apparatus for producing a grating image, which at least has one grating field perceptible with the naked eye, comprising the following devices:
  - device for defining a contour line of the grating field,
  - device for filling the contour line with a grating pattern, the grating pattern being described within the contour line by grating coordinates,
  - device for supplying the grating coordinates to a writing apparatus,
  - writing apparatus for producing the grating pattern in a substrate with the help of the grating coordinates.
31. Apparatus according to claim 30, **characterized in that** the writing apparatus is an electron beam.